United States Patent

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ALGORITHMIC METHOD AND COMPUTER SYSTEM FOR SYNTHESIZING SELF-HEALING NETWORKS, BUS STRUCTURES, AND CONNECTIVITIES

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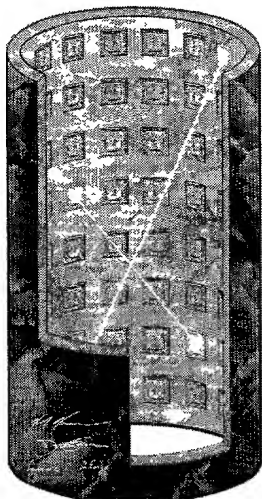Int. Cl. H04L 1/22

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Field of Search 703/13; 706/45; 370/216, 217, 223, 230, 255, 258, 238; 709/220, 223, 239, 241; 345/735, 839, 853

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ABSTRACT

The invention is an algorithmic method, or a computer implementation thereof, which *synthesizes connectivities*. In its prototypical form, the invention *computes pairwise channels for an arbitrary number of nodes, minimizing both latency and the cost of channels, such that all, or nearly all, healthy nodes remain connected, despite a prescribed number or proportion of failures in channels and/or nodes.* The invention also solves a similar problem, where minimum latency is replaced or augmented by maximum throughput. In general, channels may bear a non-uniform *cost*, nodes are assigned a *value*, each channel or node has a corresponding *latency* and *capacity*, and fault patterns may be probabilistic or deterministic. In particular, the invention optimizes the connectivity of large numbers of computers, perhaps dynamically self-organizing. Beneficial applications include the design and operation of self-healing, fault tolerant multicomputers and wired networks, as well as wireless networks having little or no dependence on central antennae.

$$\lim_{n_\Sigma \to \infty} \frac{\Delta^+_{m,l,d}}{\Delta^-_{m,l,d}} = \frac{\rho^+_{m,l,d}}{\rho^-_{m,l,d}} = 1$$